

PREPARING FOR MATHEMATICS BEYOND ADVANCED ALGEBRA: A Summer Packet Experience

This assignment is designed to be a review of topics covered in Advanced Algebra. Please complete the packet prior to the first day of class for the 2020/2021 school year. **The answers are attached** so that you can check your work. Do not use the answers provided to put yourself at a disadvantage, understand that you are responsible for the information in the packet and it will not be re-taught in your next mathematics course. Questions regarding the packet will be addressed within the 1st couple days of class. Showing your work and making your thinking visual is extremely important. Notation used in the provided answers is the expected notation in your next class.

- **Please use your own paper to answer the questions in order.** Do NOT go back and forth writing answers on the packet itself and your own paper!
 - Please keep your notes from Advanced Algebra and use them to assist you with these topics.
 - www.khanacademy.org is a great resource that can provide you with additional instruction on many topics if needed.
 - If you lose the packet you can reprint it from the Math or Guidance Department Page of the Willowbrook website.
 - It is in YOUR BEST INTEREST to complete this packet to insure your success within your next mathematics course(s).
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Use your own paper do NOT write in this packet.

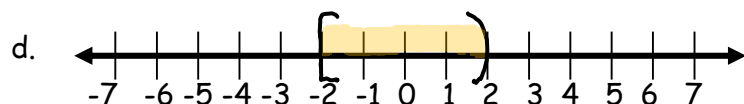
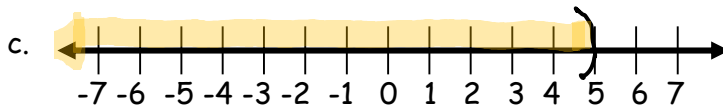
The packet will not be turned in.

Interval Notation - Real Numbers - This is also the format we use to graph intervals.

1. Use an inequality to describe the interval of real numbers.

a. $[-1,1)$

b. $(-\infty,4]$



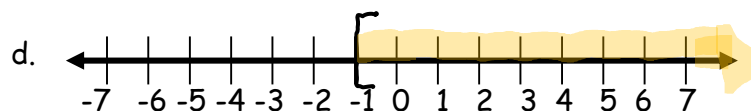
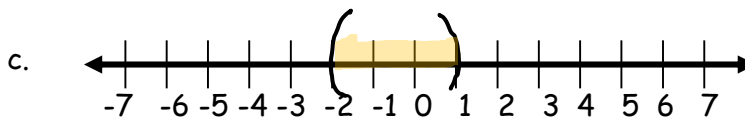
e. x is between -1 and 2

f. x is greater than or equal to 5

2. Use interval notation to describe the interval of real numbers. Note the format used to graph.

a. $x > -3$

b. $-7 < x < -2$



e. x is greater than -3 and less than or equal to 4

f. x is positive

3. Convert to inequality notation.

a. $(-3,4]$

b. $(-3, -1)$

c. $(-\infty,5)$

d. $[-6,\infty)$

Modeling and Equation Solving

- 4 a. According to the numerical model, what has been the trend in females joining the work force since 1954?
- b. In what 5-year interval did the percentage of women who were employed change the most?

| Year | Female |
|------|--------|
| 1954 | 32.3 |
| 1959 | 35.1 |
| 1964 | 36.9 |
| 1969 | 41.1 |
| 1974 | 42.8 |
| 1979 | 47.7 |
| 1984 | 50.1 |
| 1989 | 54.9 |
| 1994 | 56.2 |
| 1999 | 58.5 |
| 2004 | 57.4 |

Employment Statistics

Source www.bis.gov

5. Use your calculator to model the data graphically with a scatter plot showing the percentage of women employees as a function of time, measure time in years since 1954, $t=0$ corresponds to 1954. Use your calculator to create the scatter plot. Provide a sketch of what your calculator shows.
6. Model the data algebraically with a linear equation of the form $y=mx+b$. Use 1954 and 1999 ordered pairs to compute the slopes. Then do a linear regression using your calculator to create the equation using the entire set of data. This question requires two answers. (Read this question carefully and answer ALL parts of the question.)
7. If the percentages continue to follow the linear models you found in exercise 6, what will the employment percentages for women be in the year 2009?
8. Explain why the percentages cannot continue indefinitely to follow the linear model written in exercise 6.
9. A bakery sells a 9" by 13" cake for the same price as an 8" diameter round cake. If the round cake is twice the height of the rectangular cake, which option gives the most cake for the money?
10. A garden shop sells 12" by 12" square stepping stones for the same price as 13" round stones. If all of the stepping stones are the same thickness, which option gives the most rock for the money?

11. At the Oshkosh, WI, air show, Jake Trouper drops a smoke bomb to signal the official beginning of the show. Ignoring air resistance, an object in free fall will fall d feet in t seconds, where d and t are related by the algebraic model $d = 16t^2$.
- How long will it take the bomb to fall 180 feet?
 - If the smoke bomb is in free fall for 12.5 seconds after it is dropped, how high was the airplane when the smoke bomb was dropped?
12. A physics student obtains the following data involving a ball rolling down an inclined plane, where t is the time elapsed time in seconds and y is the distance traveled in inches.

| | | | | | | |
|---|---|-----|-----|------|------|----|
| T | 0 | 1 | 2 | 3 | 4 | 5 |
| Y | 0 | 1.2 | 4.8 | 10.8 | 19.2 | 30 |

Find an algebraic model by calculating a regression that fits the data.

Solve the equations algebraically and check graphically.

Exact answers only!!

13. $v^2 - 5 = 8 - 2v^2$

14. $(x+11)^2 = 121$

15. $2x^2 - 5x + 2 = (x-3)(x-2) + 3x$

16. $x^2 - 7x - \frac{3}{4} = 0$

17. $x(2x-5) = 12$

18. $x(x+7) = 14$

19. $x^2 - 3x + 4 = 2x^2 - 7x - 8$

20. $x+1-2\sqrt{x+4} = 0$

21. $\sqrt{x} + x = 1$

22. $2x-5 = \sqrt{x+4}$

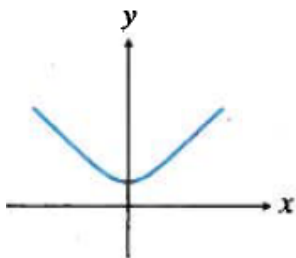
23. $\sqrt{x+6} = 2\sqrt{5-x}$

24. $x^3 - 25x = 2x^2 - 50$

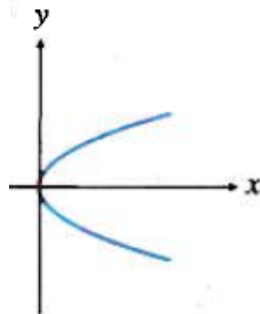
Building Functions from functions

Determine whether the curve is the graph of a function.

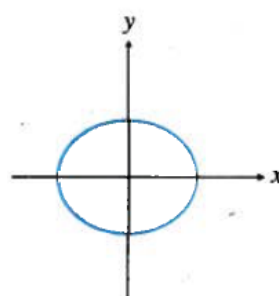
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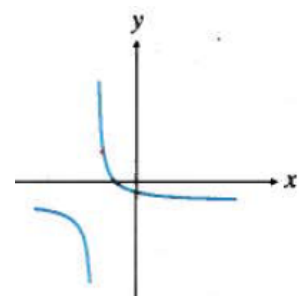
26.



27.



28.



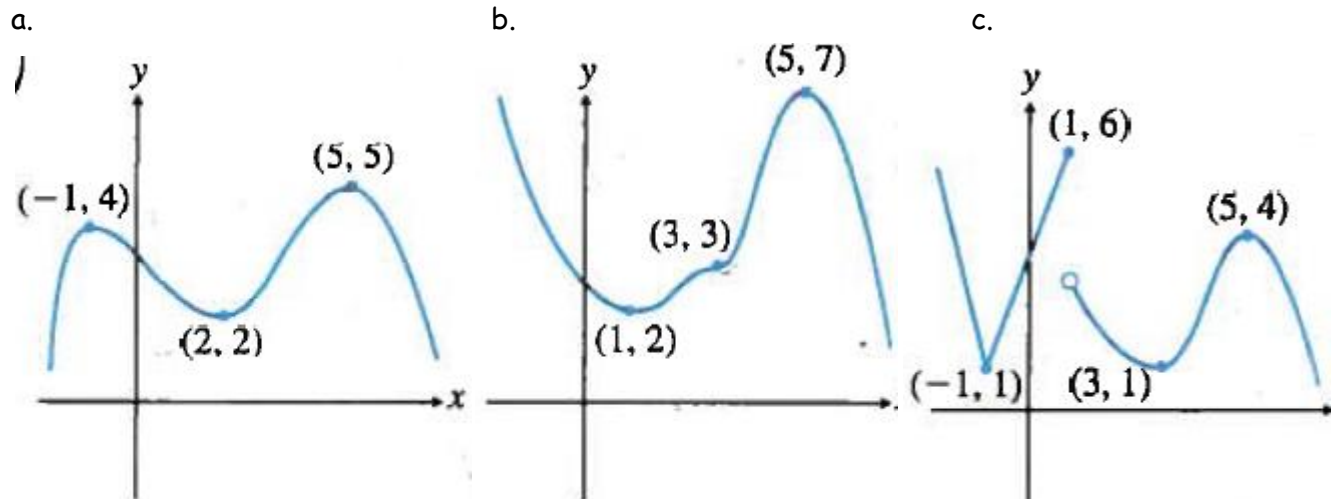
29. Find the Domain and Range of the function and support your answer graphically (include the sketch of your calculator screen). State the Domain and Range using interval notation.

a. $f(x) = x^2 + 4$

b. $f(x) = -(x + 6)^2 + 7$

c. $g(x) = \sqrt{x - 4} + 5$

30. State whether each labeled point identifies a local minimum, a local maximum, or neither. Identify intervals (using interval notation) on which the function is decreasing and increasing.



31. Graph the function using your calculator. Sketch the graph and identify intervals on which the function is increasing, decreasing or constant.

a. $f(x) = |x + 2| - 1$

b. $f(x) = -(x - 1)^2 + 3$

32. Use your calculator to find all local maxima and minima and the values of x where they occur. Give values rounded to two decimal places.

a. $f(x) = x^2 - x + 4$

b. $h(x) = -x^3 + 2x - 3$

33. Find formulas for the functions $f(x) + g(x)$, $f(x) - g(x)$, and $f(x) \cdot g(x)$

a. $f(x) = 2x - 1$
 $g(x) = x^2$

b. $f(x) = (x - 1)^2$
 $g(x) = -x + 3$

c. $f(x) = 2x^2 + 3x$
 $g(x) = x - 5$

34. Find $f(g(3))$ and $g(f(-2))$

a. $f(x) = 2x - 3$
 $g(x) = x + 1$

b. $f(x) = x^2 + 4$
 $g(x) = \sqrt{x + 1}$

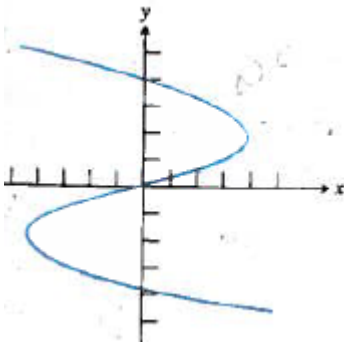
35. Find $f(g(x))$ and $g(f(x))$ $f(x) = 3x + 2$
 $g(x) = x - 1$

b. $f(x) = x^2 - 2$
 $g(x) = \sqrt{x+1}$

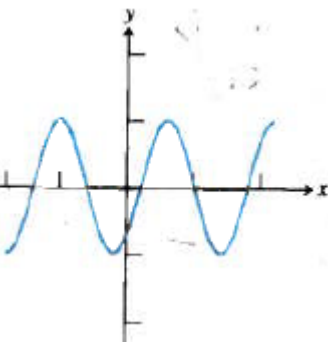
c. $f(x) = x^2$
 $g(x) = \sqrt{1-x^2}$

36. The graph of a relation is shown. (a) Is the relation a function? (b) Does the relation have an inverse that is a function?

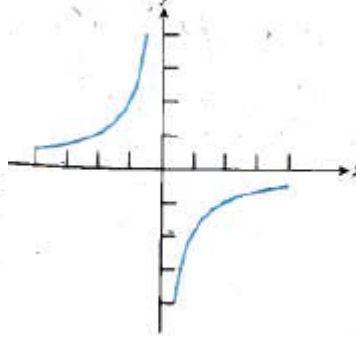
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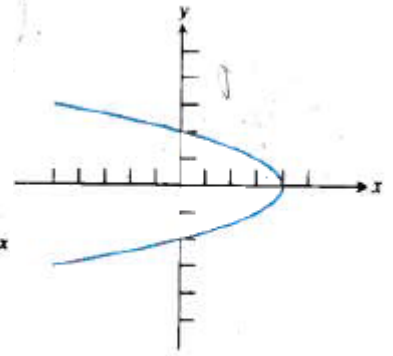
b.



c.



d.



37. Find the equation of the inverse function of $f(x)$.

a. $f(x) = 3x - 6$

b. $f(x) = \sqrt{x-3}$

c. $f(x) = x^3$

d. $f(x) = \sqrt[3]{x+5}$

38. Find the vertex and the equation of the axis of symmetry of the graph of the function.

a. $f(x) = 3(x-1)^2 + 5$

b. $f(x) = 5(x-1)^2 - 7$

39. Find the vertex and the equation of the axis of symmetry of the graph of the function. Using any method rewrite the function in vertex form.

a. $f(x) = 3x^2 + 5x - 4$

b. $f(x) = -x^2 + 8x + 3$

c. $g(x) = 5x^2 - 6x + 4$

40. Use completing the square to transform the function into vertex form.

a. $f(x) = x^2 - 4x + 6$

b. $f(x) = -x^2 - 16x + 10$

c. $f(x) = 2x^2 + 6x + 7$

41. Find the zeros of the function algebraically.

a. $f(x) = x^2 + 2x - 8$

b. $f(x) = 9x^2 - 3x - 2$

c. $f(x) = 3x^3 - x^2 - 2x$